An approximation to the Remanufactured Electrical and Electronic Equipment Consumer

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Abstract: Remanufacturing of electrical and electronic products can be considered as an excellent business opportunity from an economic point of view. The success factor in these remanufacturing activities is the recovery process of the economic value of the end-of-use products in order to achieve energy savings, lower manufacturing costs and less dependency on raw materials. This way, our research aims to study the demand of Remanufactured Electrical and Electronic Equipment (REEE). In particular, the consumer profile of this kind of products is analyzed in this paper, in order to describe what variables can determine his/her purchasing intention. This is a work in progress so the results of this paper provide a very first approach to the profile of the REEE consumer by using a descriptive analysis of the main variables, which can become an important support for future research.

Keywords: End-of-use products, remanufacturing, electrical and electronic equipment, consumer behaviour.

1.1 Introduction

In last decades many industries are undertaking environmentally conscious policies and procedures for their product's design, development, manufacturing, distribution, and end-of-life product management as a response to the global concern over environmental issues. At the same time, solid waste from manufactured goods has generated critical environmental problems, leading to more stringent environmental legislation. Confronted with the obligation to recover their end-of-life products, companies –such as Hp, Xerox, IMB, Electrolux USA, among others– have begun to implement end-of-life strategies to recover value from used products while complying with regulations (Guide and Van Wassenhove, 2001; Mukherjee and Mondal, 2009; Atasu *et al*., 2010). In this sense, remanufacturing is one of these end-of-life strategies.

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Since natural resources and raw materials are becoming scarcer and more expensive, companies with an efficient resource management can gain a competitive advantage (Porter and van der Linde, 1995). Thus, remanufacturing activities focused on the electrical and electronic equipment industry can be considered a great business opportunity (Guide and Van Wassenhove, 2001; Linton, 2008), thanks, at a great extent, to the Directive 2022/96/CE on Waste Electrical Equipment (WEEE), which obliges companies to recover their end-of-use products. The success factor in these remanufacturing activities is the recovery process of the economic value of the end-of-use products in order to obtain energy savings or lower manufacturing costs (Michaud and Llerena, 2006; Agrawal *et al*., 2010; Janse *et al*., 2010).

Nevertheless, there can be some more than economic opportunities in the remanufactured products, which are not usually being considered by many firms – for example, environmentally friendly reputation–, and which can be appreciated by environmentally concern consumers (Mukherjee and Mondal, 2009; Janse *et al.*, 2010).

Traditionally, research on remanufacturing industry has been focused primarily on the analysis of their activities from a supply point of view such as: collection, transportation, disassembly, remanufacturing, and assembly, among others (Steinhilper, 1998; Dekker *et al*., 2004; Ferguson and Toktay, 2006). However, very little attention has been paid to the demand of the remanufactured products from the final consumer. As a result, there are numerous questions about this issue and, especially, related to marketing activities and strategies for remanufactured products (Guide and Van Wassenhove, 2009; Essoussi and Linton, 2010; Michaud and Llerena, 2010).Consequently, the study of the demand of Remanufactured Electrical and Electronic Equipment (REEE) is considered the main focus of attention of our research. In particular, the consumer profile of this kind of products is analyzed in the present paper, in order to indentify those marketing variables that determine (influence) consumer's purchasing intention. Despite this is a work in progress and the results from this paper are preliminary, they can provide a valuable first approach to the profile of the REEE consumer and a good starting point for further research.

1.2 Methodology

The information required to carry out this work was achieved by a self-administered questionnaire. It was applied to students from the University of Extremadura, from April to May in 2011 and students from the University of Basque Country, from October of 2011 to January of 2012. Although the use of students sample in social sciences research is controversial (see for example, Bello *et al*., 2009 and Rodney, 2011), we have chosen university students for our work because we think they have a great potential as consumers of electronic products at large, and more specifically as consumers of computers. That is, university students are likely a large segment of potential consumers of remanufactured computers. Moreover, they are supposed to accomplish with a typical profile of envi-

ronmental consumers: young people, educated, etc., (Schahn and Holzer, 1990; Laroche *et al*., 2001; Diamantopoulos *et al*., 2003; among others) which make it easy to identify them in order to apply marketing strategies.

A total of 1873 questionnaires were collected and took part in the final sample. It implies a sampling error of 2.3%, taking into account a confidence level of 95.5%.

The contents and the design of the questionnaire were tested and outlined through two pre-tests. The first one was carried out with an expert group on market research in order to check if the key aspects of our investigation were included in the questionnaire. The second one was developed with several groups of university students from different degrees in order to confirm that the statements of the questions, their contents, and other significant aspects, could be easily understood.

The descriptive analysis of data for this work was performed by using SPSS Statistics (19 version) software.

1.3 Results and Discussion

The survey was composed by the amount of ten variables. Only four of them –that is, Knowledge about Remanufactured Products (KRP), Attitude toward the Purchase of a Remanufactured Laptop (APRL), Marketing Mix Variables (MMV) and Purchase Intention regard to Remanufactured Laptops (PIRL)– have been analyzed in this paper because they are the main variables which can help to provide a first approach to the profile of the REEE consumer.

1.3.1 Knowledge about Remanufactured Products

According to the results (Figure 1.1), only 18.74% of respondents claim to know what remanufactured products are, although 41.48% of those claim not to know them, acknowledges that he/she knows of their existence.
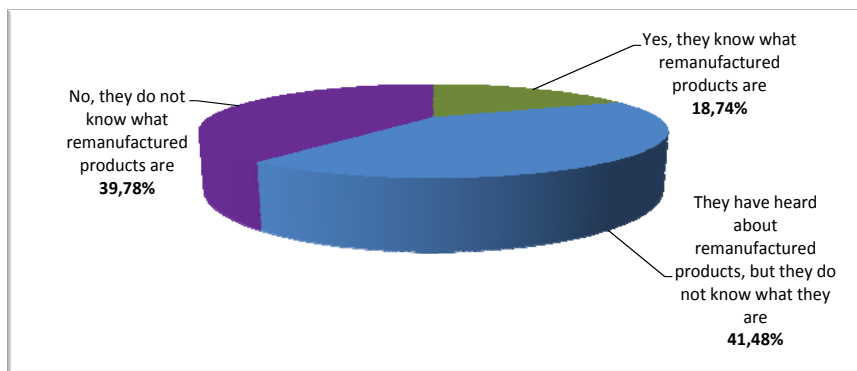

Fig. 1.1 Knowledge about remanufactured products (KRP)

Furthermore, about 60% of respondents who say they know what remanufactured products are really seem to know them, since they correctly answered all the questions asked on the objective knowledge test on certain aspects of these products –such as, manufacturing process, physical and functional characteristics, quality, guarantee, price, performance and utilization of waste and raw materials.

1.3.2 Attitude toward the Purchase of a Remanufactured Laptop

After providing participants in the survey with some information on remanufactured products, they were asked about their attitude toward the purchase of a remanufactured laptop in case of they had to buy a laptop. As it can be seen in Figure 1.2, 43.83% of the respondents claim to have a positive or a very positive attitude towards the purchase of this product. However, that just over a 31% of individuals are neutral and 12.49% do not know what to state. These two situations might be motivated by the fact that remanufactured products are poorly understood by respondents, besides being purely anecdotal their presence in the Spanish market. For this reason, they likely feel confused when it comes to defining their attitude in relation with remanufactured products.
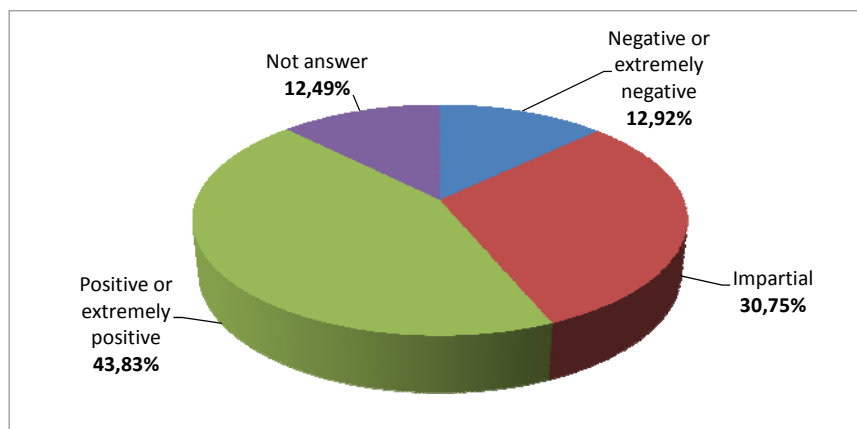

Fig. 1.2 Attitude toward the purchase of a remanufactured laptop (APRL)

1.3.3 Marketing Mix Variables

In one part of the questionnaire, respondents were asked about the four marketing mix variables –i.e., product characteristics, price, distribution channels and promotion activities– in order to discover what level of importance was acknowledged for these variables by the respondents in a purchase situation of a remanufactured laptop.

According to the results (Figure 1.3), the vast majority of individuals reported that they find it important or very important some aspects of the product such as its performance and features (91.17%) and the level of guarantee (90.74%). In

contrast, it seems that the design or the appearance of the product was little important or unimportant for respondents because over 50% of them supported that statement.
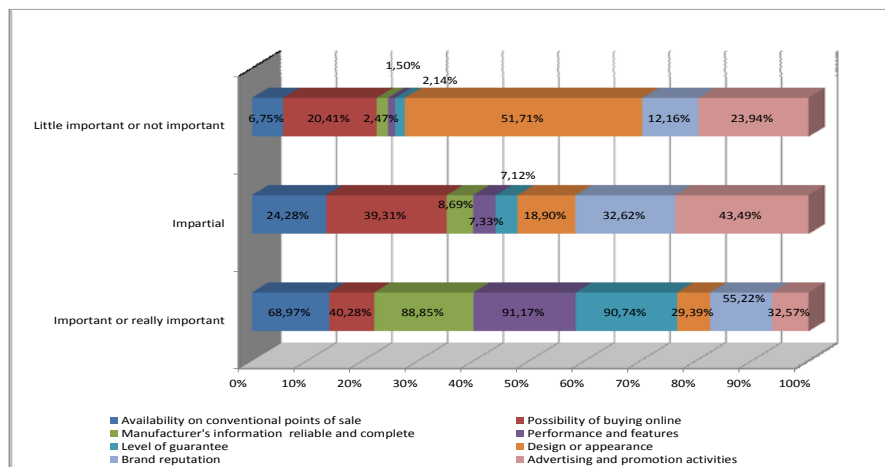

Fig. 1.3 Marketing Mix Variables (MMV1 – MMV8)

With respect to distribution activities, 68.97% of respondents felt very or extremely important that the remanufactured laptop is available in conventional shops. Nevertheless, the fact that this product can be bought or not online does not seem significant for respondents since 39.31% of them showed a neutral answer.

Regarding the information provided by the companies on this type of product, 88.85% of respondents considered important or very important that this is reliable and complete. In this sense, they argued that the Internet is one of the two main sources where they would go to seek information (52.19%) jointly with the point of sale (49.83%). Similarly, the point of sale is one of the two sources of information and advice considered more reliable (46.48%) along with specialized magazines (42.64%).

1.3.4 Purchase Intention with regard to Remanufactured Laptops

During the survey, the individuals' participation was solicited to carry out an "experiment". It consisted in presenting a hypothetical purchase situation to respondents in which they had to select one of the three products (A, B and C) described in each of the five price scenarios considered. The product A was an original laptop, the product B was a remanufactured laptop from an original manufacturer and the product C was a remanufactured laptop from a third-party or independent remanufacturer. Concerning the price situations, in all of them, the price of the product A was kept fixed at its actual level price in the market (750 euros) at that moment. However, the prices of the products B and C were increasing along the five price scenarios, from 375 euros and 300 euros respectively to 750 euros, the same price as the product A.

In relation to the results of the "experiment", it can be observed (Figure 1.4) an increasing tendency toward the consumption of remanufactured laptops from an original manufacturer (Product B) instead of original laptops (Product A) as the price difference between them raises. It suggests that individuals could consider the price a significant attribute in the purchase of this kind of product.
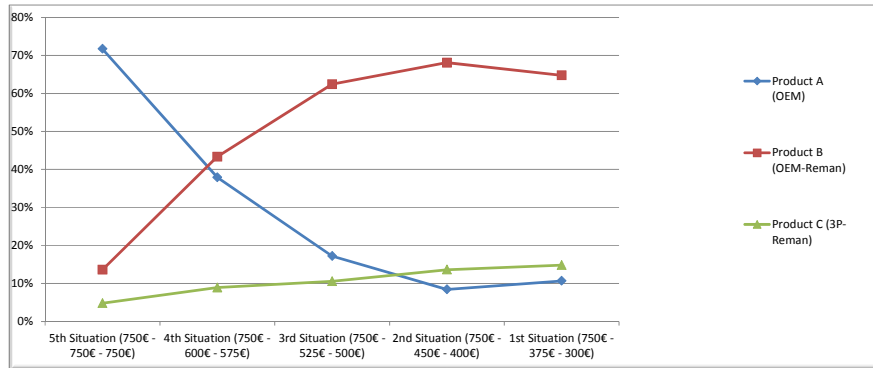

Fig. 1.4 Purchase intention with regard to a remanufactured laptop (PIRL1 – PIRL5)

Nonetheless, it can be noticed that there is a specific moment (see 1st price situation) in which that tendency is broken. A possible explanation could be the perception of "lack of quality" from the consumer related to product B due to its lower price in contrast with the price of the product A. In that case, the price of the first one is 50% lower than the price of the second one.

On the other hand, the purchase intention of a remanufactured laptop from an independent manufacturer (Product C) was significantly lower than the purchase intention of any of the two other products (Product A or B) in all the price scenarios considered, as long as the price of the laptop C is lower and it keeps the same characteristics (guarantee, functionality, technical characteristics, etc.) This seems to confirm that the reputation of the manufacturer's brand is a noteworthy aspect that can significantly influence the purchase intention. Furthermore, it is remarkable that a small percentage of respondents (4.78%) were willing to acquire the product C although its price was the same as the price of the product A and the product B (see 5th price scenario). It could be explained by the fact that these individuals would take into account environmentally concern motivations apart from others in a laptop buying situation.
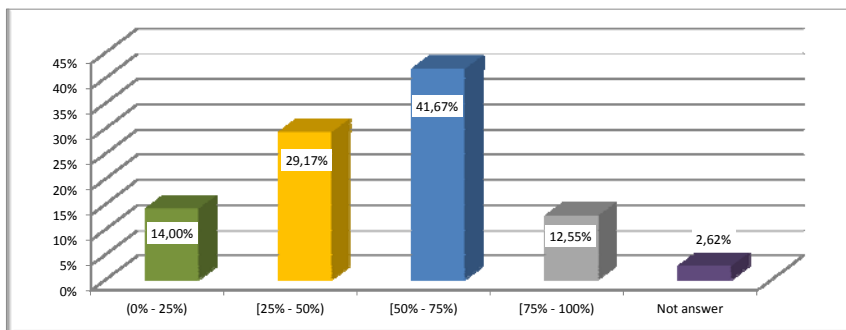

F**ig. 1.5** Purchase intention with regard to a remanufactured laptop (PIRL6)

Finally, when respondents were asked about their general intention to buy a remanufactured laptop, in case of they are thinking about purchasing this kind of product (Figure 1.5), 54.22% of them assigned a probability higher than 50%. It seems to confirm that the more individuals know about remanufactured products are, especially about their similarities with the original ones, the more willingness to purchase a remanufactured laptop the individuals will show. Despite it has just been stated and there was a 12.55 % of individuals who claimed that the possibility of acquiring a remanufactured laptop was higher than 75%, there was still a percentage of individuals (14%) who was little reticent to buy this kind of products (0% - 25% probability).

1.4 Conclusions

This paper aims to study the demand of REEE from the final consumer by analyzing the main variables which can depict the consumer profile of this kind of products.

At first sight, the results of our descriptive analysis support the majority of ideas derived from the literature review about the marketing of REEE, such as the consumer ignorance about this sort of products (Majumder, 2001; Subramaniam and Subramanyam, 2010; Subramaniam *et al*., 2010), the price as a relevant attribute to take into account in purchasing decisions (Jacobsson, 2000; Debo *et al*., 2005; Ferguson and Toktay, 2006), the influence of the manufacturer's brand reputation on the purchase intention (Agrawal *et al*., 2010; Essoussi and Linton, 2010) or the positive influence of the environmental concern on the attitude toward the purchase of such products (Michaud and Llerena, 2006; Mukherjee and Mondal, 2009; Atasu *et al*., 2010), among others. Nevertheless, such results contradict some other ideas which had been seen put forward formerly –for example, the idea that the possibility to acquire products by Internet is significant for the respondents (Subramaniam and Subramanyam, 2010; Subramaniam *et al*., 2010)

Since this is a work in progress, the results are preliminary so it would be advisable to wait for the results from a structural modeling analysis in order to analyze the aspects of the consumer profile in greater depth. However, these preliminary results provide a first approach to the REEE consumer profile, which might be especially useful for future research –for instance, suggesting marketing policy recommendations for companies interested in fostering the demand of REEE.

1.5 Acknowledgements

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